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Biology During the War—and After

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As American education swings into full support of the war effort every teacher striving to make his maximum contribution is faced with decisions of great importance and complexity. In a recent county conference of high school teachers the problem of redirecting and expanding the work of the school to meet our greatest need was extensively explored. In discussing what might be achieved through their subject the biology group mentioned so many specific objectives for inclusion or re-emphasis in relation to the war that considerable bewilderment and uncertainty was evidenced by the participants. A satisfactory conclusion could not be reached. The question repeatedly raised was "How can all these things possibly be taught in our already overcrowded course?"

The important position which biology holds in the high school curriculum makes this unwholesome condition all the more serious. In a nation at war the physical and mental health of the population is a primary objective since wars are won as much by the efforts of those at home as by those in uniform. In total war the sustenance of morale through sound mental and physical health is fundamental to the sacrifice and efficient effort required. Biology occupies a key position for meeting these needs. Of the high school sciences it has by far the largest enrolment. War industries in many states are already reaching down into the classroom for workers. Many students will leave school at sixteen, perhaps younger as the pace increases. For large numbers of students, therefore, biology is their last contact with organized science. Judged in the light of these facts the dissection of the earthworm, the study of the vascular system of the starfish, or the cataloging of characteristics of *Pithecanthropus erectus* stand forth as educational absurdities.

Many teachers faced with the problem of "What to teach?" are overcome by the amount and variety of things that may be done. They seem unable to decide what to accept or reject. Or, having

decided, they fear lest they will be unable to justify their choice. To these teachers, return to the traditional topics often seems the safer if not the more practical course. Numerous curricular research studies in biology are available. But nearly half of the high school biology teachers, according to the recent study of the Union of American Biological Societies, have their specific training in some other field. It seems likely, therefore, that a considerable number of biology teachers have neither the training nor the time to use the research studies to best advantage. And, measured by present needs, it is doubtful whether the time so spent would be profitable.

It seems clear that some simpler method of meeting this problem must be found. The method must make possible the production of a more worthwhile biology course, must be adaptable to different communities, must be usable by teachers who are not trained specifically either in biology or in educational research, and it must give almost immediate results. The need for prompt decisions and actions at the present time is especially emphasized by the Educational Policies Commission in "A War Policy For American Schools."[1]

The crux of the whole problem is, of course, one of assigning relative values to a number of activities or objectives. We hesitate to trust our judgment because we are uncertain of the bases upon which such judgment should be made. In relation to the question of "What is desirable?" Dr. Thomas H. Briggs[2] has proposed four criteria as guides: frequency, cruciality, generality, and permanence. These are so obviously justifiable and so easy to apply that anyone who is unable to devise his own satisfactory standard of values would find it profitable to consider them. Let us briefly examine each of these criteria in relation to high school biology.

We use the criterion of frequency when we decide to include those things which we need to know or to do with greatest frequency in our everyday life. It is more important to know what to do for the common cold, or syphilis, or tuberculosis, than for leprosy or spotted fever. In some sections of our country the last may be common enough to constitute a real need. With only a certain amount of time at our disposal we must first consider for study the things which are needed most often.

The criterion of cruciality suggests that some things are so important when we meet them that we must be able to act even though the occasion seldom if ever occurs. A high school student taking a dangerous short cut across a railroad line found his path barred by a slow-moving freight train. Ascending the train impatiently, he slipped and fell, severing one leg at the knee. A witness saved his life by a knowledge of pressure points and ability to use the tourniquet. Few people in life ever meet this situation and yet when it occurs it is so crucial that everyone should be able to meet it. This true illustration provides further thought on the degree of learning with which most of our high school students seem content. In such a situation, seventy per cent or partial learning is worthless.

Some activities or principles are so widespread or fundamental in their application that they must be included

[1] National Education Association and American Association of School Administrators, Educational Policies Commission. *A War Policy for American Schools.* 1942. p. 27.

[2] Briggs, Thomas H. *Improving Instruction.* The Macmillan Company, 1938. pp. 223–231.

because of their generality. Those things which meet the need of the greatest number of students must have preference over those which meet the needs of a few. The cell as the unit of structure and function of all living things, and the normal functioning of our own body processes are so general that no one could conceive of a biology course without them. Conversely, the ability to name all the bones in the body, or to make detailed classifications of insects is needed by so few students that it should be included only in a course designed for students preparing for a vocation within some definite area of biology. Even then it would hardly be justifiable until more general topics had been included.

In a choice between two objectives that have a high degree of frequency and of generality it is often necessary to apply the criterion of permanence. That which is usable over a long period of time or will give the most sustained satisfaction should have precedence over things of minor importance or of day to day interest. It is more important to know a few good food sources of each of the vitamins than the most recent study of queer foods eaten by people around the world. How we can correct common errors in our thinking, or choose mates which will improve rather than lower our hereditary strain has far more justification than the ability to draw and label the nervous system of man or to trace the origin of various tissues during our embryonic development.

Perhaps the examples used here are so simple that there is no doubt in anyone's mind about them, or is it, perhaps, that the criteria are easy to apply because we are convinced of their soundness? Studies of what high school biology teachers are including in their courses would quite likely include all the items just named and, if the criteria are valid, for some students and for some sections of the country they might be justifiable. But we are met with our greatest national emergency and we want to feel, students and teachers alike, that we are using our time in the way that will give us the greatest return. For that reason we need to have some definite standard by which we can judge our present effort and appraise the new suggestions advanced by laymen, public officials, and school administrators. At no previous time have we ever had so great need to "justify our teaching."

One may be in complete agreement with the stated criteria and yet take no consequent action and thus have no real satisfaction from doing one's part. The following direct steps are, therefore, suggested as one approach to the implementation of this idea.

1. List in some detail the specific objectives sought in high school biology and any additional ones proposed for inclusion into the course. Whether these objectives are stated as generalizations, topics, principles, problems, or other forms does not seem a point for argument here. The important thing is to do something and to do it at once.

2. With particular attention to the needs of the students in your community and their relation to this critical war period assign numbers 1, 2, 3, etc., in the order of desirability to the objectives listed. Objectives in your list which are fully covered in some other subject in your school such as health education, should be dropped from your list. Refer to the criteria proposed by Dr. Briggs to help judge the relative worth of each objective. It would seem desirable to have students check the list, also, after they have discussed the criteria. Permit anyone who checks the list to add any additional items he thinks should be

added. When the student participates in the selection of the material he is to study, the purposes are clearer and more worthwhile to him and the work will be greatly motivated.

3. If more than one person checks the list the order numbers may be added for each item and the item with the lowest total given No. 1, the next lowest No. 2, etc. This will give a composite rating which might be weighted if desired but perhaps this suggestion should be omitted in the interest of prompt action.

4. Beginning with the objective judged most worthwhile estimate the time required to teach it. Next estimate the time required to teach the item of second highest desirability. Continue in this manner until enough items have been marked to occupy all available time. These then will be the things which it seems are most important for your students now. This might be a good time to contemplate the comment of an administrator, "What you biology people ought to do is to teach fewer things better."

5. The selected items should be regrouped into units for more efficient teaching. Many teachers may be shocked at the items they have thus decided are desirable for teaching in their courses. They may hesitate to trust their judgment and to proceed on it because of their previous ideas. But we should not permit ourselves to include extraneous material simply because it has always been placed with some unit. If it is felt that some omitted activities ought to be included it may be possible to cover a number of items of seemingly special value and interest as projects and extra assignments for those especially interested. However, the procedure here described seems fully justifiable in terms of the students' needs because it will produce a course in which both teacher and students can have faith. And faith in our purposes is the essence of supreme effort.

The Use of Miniature Dioramas as a Visual Aid in Biology

CHARLES W. GOUGET
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Next to a first-hand experience the diorama probably provides the most objective proof of reality in its natural setting. Obviously the same perception cannot be obtained from a picture, a diagram, or even an occasional model since these devices do not show space relationships adequately. Pictures on flat surfaces do not bring the observer into proximity with the spacial factors of a setting which make the diorama possible. It is more difficult for the observer to imagine himself as a part of a picture relationship, consequently it is less objective and much less real to him. The diorama supplies the third dimension to successful teaching.

Little successful teaching can be done among high school students without active school work of some kind. Without activity, reading, writing and reciting will finally become passive hum-drum which will lead to disorder in the end and little or no learning. High school

students are creatures of activity, and since they see to a large extent through their finger tips they should have the opportunity to do creative work with their hands. It is not enough for a teacher to insist that each student shall do something without offering some very definite suggestions as to what each may do. Suggestions should cover a wide range of activity so as to provide for the most gifted and the least gifted members of the class. Many of the projects may be worked out in groups in which case the mechanic, the architect and the artist may work together to turn out a worth while product.

Miniature Diorama Construction

The construction of a Miniature Diorama from plastic clay provides a variety of activities for a real group project. The diorama cases are about one foot square and eight inches wide. They are usually made by students interested in woodwork although many types of ordinary wooden boxes may be used. Many students may cooperate in this phase of the project since it involves cutting, fitting, sanding, painting, etc.

Those who are interested in art cooperate in modeling the figures and in painting the background. The figures are modeled about a wire frame or armature which passes directly into the baseboard of the case to provide ample support. Additional support is usually provided at inconspicuous points by wire nails which are nailed into the sturdy wooden parts of the setup. The plastic clay figures are pushed on to the wire nails to prevent them from falling forward because of their own weight. Plastic clay can be painted most successfully with oil paints, although ordinary poster colors may be used with some success if no water has been added to them. The background is usually done in water colors on heavy cardboard which has been bent into a semi-circle. A thin veneer of clay is used on the base to blend the foreground into the background, and to form a substance into which artificial plants, etc., may be fastened.

Trees are made from small twigs which are forced on to small wire nails for support. Leaves and other types of vegetation may be made from artificial flowers obtained at the ten cent stores. Imitation rock formations are made by smearing ordinary screen wire with plastic clay. The screen wire can be bent into any shape desired and tacked into position on small blocks or strips of wood for support.

When the figures are properly supported and protected by glass in the diorama case, the exhibit becomes a permanent addition to the classroom. Each new addition creates new interest and spurs group activity towards the completion of a museum as the ultimate goal in the Biology Classroom.

Types of Miniature Dioramas

The types of dioramas constructed by high school students in biology may be classified under three headings, namely:

1. Prehistoric Plant and Animal Life —including Prehistoric Man.
2. Nature Study.
3. Natural Formations—such as those found in a coal mine or an oil well.

Of the three types mentioned those which deal with Prehistoric Man seem to be the most popular among the students.

Since high school students, for the most part, are passing through a "dreamy" stage in their development they are highly imaginative, and receive a great deal of satisfaction from associating themselves with strength and power, because it is through such means that they hope to accomplish great

things. Not long ago every high school had its "Tarzans" who rushed about the corridors to fall upon some anemic classmate and to shake him by the neck until the victim's teeth rattled. Having accomplished his purpose Neanderthal Style "Tarzan" usually shoved his half-dazed friend aside, thumped his own chest with his fists, and let loose a petrifying war-whoop to demonstrate his superiority.

Much the same type of responses are manifested during the construction of miniature dioramas on Prehistoric Man. It is apparently much easier for a student with a good imagination to make himself a part of this type of diorama because it deals with primitive human beings with instincts much the same as his own. Since the student has something in common with the thing he is studying in this case he can fit himself into the picture more easily. Some dioramas constructed on the above plan are as follows, namely:

1. The Carboniferous Period.
2. The Age of Dinosaurs and Giant Lizards.
3. The Neanderthal Man and Family.
4. The Cave of Cro-Magnon Men.
5. Pottery Making.

Next to their own likeness high school students are most interested in animals closely related to Man, *i.e.*, small mammals, birds, etc. As in the case of the Cave Men, students are interested in where the animals live, what they eat, and how they build their homes. This is all very fruitful ground for diorama construction. The following titles represent a few of the dioramas that have been constructed on Nature Study,

1. The Mountain Goat.
2. The Mountain Lion.
3. The Home of the Beaver.
4. A Woodland Community.
5. The Prairie Dog.

In so far as most Natural Formations lie more directly in the special field of Geology this field has been little emphasized in our work, except for those formations that deal with coal and oil.

The Teacher's Part

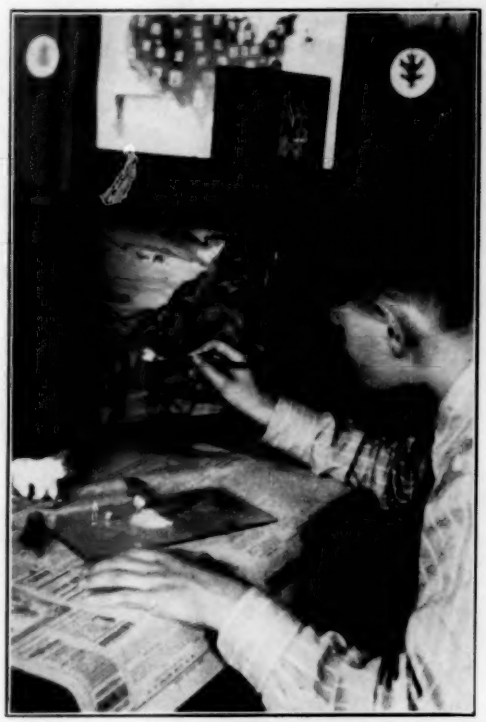
The successful teacher is a good strategist. His aim is to maintain enthusiasm among his students with all the art in his power. To maintain enthusiasm he must be the source of inspiration; he must be the "jack of all trades" who can help the student who gets stalled on "dead center"; he must be the driving force that insists that a thing once started shall be carried to completion, and he must be the source of those materials that may be difficult for most high school students to obtain. In addition a successful teacher must be "alive." He should be vitally interested in his subject, willing to work with the students and willing to set the example for hard work. Above all his procedure should be planned to anticipate possible difficulties so that action will continue undisturbed in a definite direction.

Unlimited suggestion on the part of the teacher is the secret of activity on the part of the students. Abundant suggestion creates a desire to do something by stimulating the imagination, but this initial momentum thus created will not usually carry a project through to completion. Care should be taken to fit a project to the ability of the student, but when this has been accomplished it is the teacher's job to help the student face the new situation so that he may not be discouraged at the outset. Cooperative planning will insure success at the start.

The construction of a diorama requires considerable study and planning on the part of students. It requires the exer-

cise of considerable judgment in the selection and arrangement of materials, and involves the use of many skills through manipulation. It places learning on an objective basis by making the subject matter concrete to all of the senses.

Among high school students learning words is useless without some experiences to give meaning to them.



Diorama construction requires the exercise of judgment in the selection and arrangement of materials.

ACID PROOFING TABLE TOPS

Steps for acid proofing hardwood table tops.

1. Clean and sand-paper the table top.
   a. Fill in gorges in table top by using plastic wood.
      1. Use plenty of plastic wood.
      2. Sand-paper down.
2. Apply #1 Solution hot to the table top and allow this coat to thoroughly dry. (Do not hurry the following processes.)
3. Apply #1 Solution hot the second time to the table top and allow this coat to thoroughly dry.

FORMULA FOR #1 SOLUTION

125 grams copper sulphate.
125 grams potassium chlorate.
1000 grams water.

4. Apply #2 Solution hot to the table top and allow this coat to thoroughly dry.
5. Apply #2 Solution hot the second time to the table top and allow this coat to thoroughly dry.

FORMULA FOR #2 SOLUTION

150 grams good fresh aniline oil.
180 grams concentrated hydrochloric acid.
1000 grams water.

6. Table top now looks mottled green. Scrub hard with a hot, gold dust solution; use a hard brush; wash off. Table top now black and mottled green. Dry thoroughly.
7. Apply to table top, hot raw linseed oil. Be certain the oil is hot. Use a cloth and rub oil in thoroughly. Don't put too much oil on, but rub thoroughly. Table top now is a very dark black color.
8. Table top may need a second coat of linseed oil. Allow to dry for two weeks.
9. Every six months wash the table top thoroughly and apply linseed oil. (This keeps table tops in excellent condition.)
10. This is a chemical process completed in wood; insoluble in water; and acid proof.

HELEN TROWBRIDGE
Glen Ellyn, Illinois

President's Page

Our fourth year as a National Association is drawing to a close. During that time we have climbed from a small group of men with an idea—a dream—to an organization with an international distribution. It has fulfilled the dream. Nor has anticipation been greater than realization, for with each new affiliated local, each new member added, the scope of possibilities has enlarged.

But our growth cannot stop here even with the hard years that may be before us. We must keep working, yes, even harder than ever because we have our original purpose to fulfill as well as the added one of helping in defense. We may have to curtail a few regular activities and substitute something that is of more immediate need. Isn't that what each of us is doing in our daily life? And with your help our association will do it, too. One of the best ways to serve our nation is to keep right on taking care of the young people, who, in a few years, will be taking the places of those called to the immediate duty of our country. If these young people are not prepared to live, to work, and to build, we will have a most serious situation. Then, let each one of us do his part by supporting the National Association so that it may carry on its work of aiding the youth through the teacher.

Mr. M. A. Russell, our new president, will appreciate all the cooperation you can give him. If the members, as well as the officers, give him the support that you have given me, I am sure that the present world condition will build, rather than destroy, our organization. If you could see the untiring, unpaid hours that the officers have given to your work you would never let them go without the reward of knowing that you are back of them. Some of you will be with the armed forces of our country. Would you mind leaving one—just one—of your dollars with us so those who remain can carry on the work here while you are gone? You will never regret it. To those who must stay here, we will need both your dollar and you. Everyone is calling on you for that. We will have to give to the very end, then give of ourselves.

But that is one of the biggest objectives of our association, to aid teachers in the giving of themselves to their students. We can give our time, our energy, our education and get paid in money for it. But when we give of our inner selves our pay is of more value than money. Our pay then comes in the form of friendships, of the satisfaction of seeing a potential mind develop into one of activity and leadership and of knowing that we had a part in that work.

Then, as retiring president, my last wish for the association is that its members will continue to give of their time and money and when the money is gone to continue giving of themselves. Have you brought in a new member this year?

I wish to thank the present officers for their splendid support and I hope that the new officers will give Mr. Russell the same support. His time is yours, so make yours his.

HOMER A. STEPHENS.

SINCE the editor may be out of Emporia during most or all of the month of August, manuscripts intended for the October issue should if possible be submitted before the end of July.

OFFICERS FOR 1942-1943

The results of the recent election of officers of *The National Association of Biology Teachers* have just been announced by Miss Betty Lockwood, chairman of the Election Committee. The officers are as follows:

President, M. A. Russell, Royal Oak, Michigan (chosen President-elect in 1941; automatically becoming president in 1942).

President-elect, Helen Trowbridge, Glen Ellyn, Illinois.

First Vice President, Paul B. Mann, New York City.

Second Vice President, Prevo L. Whitaker, Terre Haute, Indiana.

Secretary-Treasurer, P. K. Houdek, Township High School, Robinson, Illinois.

The new president, Mr. M. A. Russell, has been a teacher of biology and general science in the Highland Park Schools, Highland Park, Michigan, for the past 25 years. He is a graduate of Michigan State Agricultural College and holds the degree M.A., University of Detroit. He served as Second Vice President the year before he was elected to the office of President-elect, from which he automatically succeeds to the presidency. He has been an associate editor of THE AMERICAN BIOLOGY TEACHER from its beginning. He has served as President of The Detroit Biology Club, of The Science Section of The Michigan Schoolmasters Club, and of The Highland Park District of the Michigan Educational Association. He is a member of The Detroit Biology Club, The Detroit Audubon Club, The National Education Association, and the Department of Science Instruction of the National Education Association. Aside from teaching, his chief interests are nature study and gardening. He has been a Nature-Lore Director at summer camps and has supervised home and school gardens in Highland Park. Farming is also an interest, since he was born and lived his early life on a Michigan farm.

Biographical sketches of the other officers were published in the February issue of THE AMERICAN BIOLOGY TEACHER. All of them have been active workers in the organization and can be depended upon to give their best efforts to the advancement of biology teaching. The editorial staff herewith extends, on behalf of the entire association, congratulations and sincere best wishes for a happy and successful year of service.

REGIONAL MEETINGS

DETROIT, MICHIGAN

A regional meeting of the *National Association of Biology Teachers* will be held in Detroit, October 10, 1942, with headquarters at the Book-Cadillac Hotel. The morning session will be based on Biology and Defense, with Dr. Paul Krone, Michigan State College, M. C. Lichtenwalter, Lane Technical High School, Chicago, Dr. Loren W. Shaffer, Detroit Board of Health, and Dr. Arthur H. Smith, College of Medicine, Wayne University as speakers. Contributing to the afternoon program, on the theme of Biology and Conservation, will be Howard Michaud, Fort Wayne, Indiana, Walter Hastings, Michigan Department of Conservation, Dr. E. Lawrence Palmer, Cornell University, and Dr. William Steere, University of Michigan. Dr. Max M. Peet, University Hospital, University of Michigan, will be the banquet speaker.

In September all members of the *National Association of Biology Teachers* will receive literature concerning train and bus connections, hotel rates and a side trip to Cranbrook Institute of Science. If you are not a member and are interested in receiving a notice concern-

ing the program, write to the chairman, Miss Betty Lockwood, 18420 Wisconsin Avenue, Detroit, Michigan.

CHICAGO, ILLINOIS

The Chicago area will hold its second annual regional meeting of the *National Association of Biology Teachers* on October 31, 1942, at the Morrison Hotel. Although the details of the program have not yet been worked out, the general plans for the meeting are well under way. The entire session, including exhibits, will be of interest to all biology teachers. Attendance at the evening banquet should be "chalked down" as something that will make October 31st complete. Remember! Mark the date on your calendar of activities and come to the Morrison Hotel in Chicago for one of your most outstanding and worthwhile days of 1942–43. The full program will be announced in the October issue of THE AMERICAN BIOLOGY TEACHER. For other information, write to the 1942 regional chairman, Mr. I. P. Daniel, Lakeview High School, Chicago, Illinois.

AUDUBON NATURE CAMP

The Audubon Nature Camp for Adult Leaders opens for its seventh season June 12th for five two-week sessions in 1942. Teachers and youth leaders from all over the nation will gather here.

The camp, located some 65 miles northeast of Portland, Maine, is in the Todd Wildlife Sanctuary, an island comprising 330 acres of climax spruce forest, at the head of Muscongus Bay. This forest, the interesting rocky, sandy and mud shores, the farms, open fields, hardwood forests, freshwater ponds and marshes of the adjacent mainland, seabird colonies on nearby and outlying islands, combine to form a fascinating outdoor laboratory. A daily program of field trips in these varied habitats affords campers opportunity to observe living plants and animals at first hand. Special emphasis is placed on the interrelationships between plants and animals and their dependence upon conditions of light, soil, water, weather as illustrated in the different types of environment visited. Practical suggestions for presenting nature study in schools, camps and clubs are stressed.

A young experienced staff offers field classes in nature activities, birds, plants, insects and marine life.

For illustrated folder and application blank, write to Box 5, National Audubon Society, 1006 Fifth Avenue, New York, N. Y.

Youth Speaks for Biology

JOHN E. SHOOP
New Rochelle High School, New Rochelle, N. Y.

The place of Biology in the curriculum of our secondary schools has been much discussed by educators and laymen, but little or no attempt has been made to obtain the opinion of the boys and girls who are the actual recipients of this instruction, and whose needs and interests are the center about which courses of study should be formulated. In such complex times as these it is necessary for administrators and teachers to keep in touch with the changing needs and interests of the students so that the subject matter of the courses of study may be frequently modified to stress the topics which will be of greatest value to the students at the present time and will also be a preparation for their probable future needs.

Recognizing this necessity for changing stress of certain biological topics, the teachers of the Biology Department of the New Rochelle High School have at the end of each year placed in the hands of all students completing the course a questionnaire designed to determine the student's own personal reaction to the content and conduct of the

course as he has been affected by it. This student reaction is of two-fold value because it reflects not only his own but also his parents' attitude toward the subject matter of the course. This method has proven very satisfactory in modifying and correlating the work for the following year in line with the suggestions and criticisms as compiled from the questionnaire.

Up to the school year 1940–41 the questionnaire had been made out by the teachers of the department, but this year, endeavoring to create a greater freedom of expression by more student participation, the organization and construction of the questionnaire was put into the hands of a representative group of biology students known as the Biology Council. This Council is composed of one elected representative from each biology class, comprising ten in all, and representing two hundred and forty-one students. This group elects its own officers who preside throughout the year. Council members are the contact agents between the teachers of the department and the students in the classes. It is their function to introduce changes of policy and to bring to the attention of the teachers such student suggestions as they think will make the department operate more smoothly.

In preparing the questionnaire the members of the Biology Council were given specific references in the Library on the making of questionnaires and their contents. They also had an opportunity of seeing questionnaires and surveys in this field and other fields. One of the references that they examined was an article by J. W. Galbreath entitled "An Interest Survey in Biology" published in THE AMERICAN BIOLOGY TEACHER for November 1940. Since one of the purposes of the questionnaire was to determine student interests, the Council members decided to use the thirty-three topics mentioned in this article, in order to compare the rank of student interests in New Rochelle with that of the school mentioned.

During the second week of June, at the completion of the course, this questionnaire was put into the hands of the students by the Council Representative of each class, who very carefully explained each question and asked for the candid opinion of each student on every question. The papers were then collected and all the results tabulated by the Council Members. A copy of the questionnaire with the answers tabulated in percents for 241 students follows:

This questionnaire is being put into your hands to determine what parts of the course should be changed to meet the abilities and interests of students who may take it in succeeding years. We are asking for your candid and whole-hearted opinion of the course as you have taken it this year. Your suggestions and criticisms will be used to make the course a better one. You will not be asked to give your name or class.

Please indicate your opinion by circling the appropriate word or term at the right of each question.

1. Have you liked the course as it has been given this year?
   Yes 96%; No 4%
2. Knowing the type of course that it is, demanding the amount of homework that is necessary, would you advise other students to take it?
   Yes 96%; No 4%

(In this course of study no one textbook is used. In its place a seventy-five page contract booklet consisting of a series of questions and diagrams based on topics taken from the New York State Syllabus is given to each student. These questions cover material in forty-seven different textbooks, which the student secures from the library. Practically all of this reference work is done outside of class. Doing the contracts is optional rather than mandatory, as the material is all covered in lectures, but most of the students prefer to do the outside reading for background.)

3. Which did you like better, lecture work or laboratory work?

Lecture	52%
Lab.	20%
No choice	28%

4. Do you think that the amount of individual laboratory work should be

Increased	35%
Reduced	21%
Entirely eliminated	1%
No change	43%

5. In relation to the other subjects you have taken, where would you place this subject as to interest?

First	66%
Second	27%
Third	7%

6. In relation to the other subjects you have taken, where would place this subject in regard to immediate personal applicability?

First	71%
Second	20%
Third	9%

7. In relation to the other subjects you have taken, where would you place this subject in regard to future personal applicability?

First	65%
Second	22%
Third	10%
Fourth	1%
Fifth	1%

8. Do you think that the contract method, as used this year, is valuable enough to retain?

Yes 70%; No 30%

9. Would you prefer a single textbook to the method now in use?

Yes 18%; No 82%

10. Would you like to have a library period included in the course during regular class time?

Yes 49%; No 51%

11. Do you approve of the Biology Club as organized this year?

Yes 78%; No 22%

(The Biology Club is made up of those members of the Biology classes and any other students in the high school who wish to participate. There are no dues; it is supported by the General Organization. The Club meets bi-weekly throughout the year, and its general program includes outside speakers, exhibits, field trips to hospitals and museums, etc. It has its own elected officers consisting of President, Vice-President, Secretary, Treasurer (who collects funds for trips, etc.) and Publicity Chairman. There were 210 members in the Biology Club during the past school year.)

12. Do you think that the Biology Club has supplemented your cultural background in Biology?

Yes 70%; No 30%

13. Did you find that the illustrated lectures were more valuable to you than the lectures without the visual aids?

Yes 85%; No 15%

14. Do you think it is more valuable to have tests given

Daily	12%
Weekly	45%
At the end of each unit of work	43%

15. Do you think that during sex instruction the class should be divided into non-co-educational groups?

Yes 2%; No 98%

16. Should the female members of the class have a woman teacher for sex education, and the male members a man teacher?

Yes .7%; No 99.3%

17. Do you think there should be more or less sex education?

More 99%; Less 1%

18. Would you take an additional course in the biological field if it were given?

Yes 77%; No 23%

19. Do you approve of the manner in which evolution has been taught?

Yes 91%; No 9%

20. Do you feel that evolution should be included in the course of study?

Yes 97%; No 3%

21. Has the course, as presented, stimulated a desire to inquire further into biological problems?

Yes 92%; No 8%

22. In relation to the other subjects you have taken, has the amount of homework in Biology been

Below average	8%
Average	46%
Excessive	46%

23. In relationship to the value gained from the course, has the amount of homework in biology been

Below average	24%
Average	50%
Excessive	26%

24. Has your study of Biology made you more aware of biological information in newspapers and magazines?

Yes 96%; No 4%

25. Have you become more interested in biological research and experimentation?

Yes 87%; No 13%

26. Should contracts be called for

Once per semester	28%
Weekly	20%

Every two weeks 21%
Before marking period 31%

27. Which do you feel were the most help to you?

Lantern slides 1%
Charts 3%
Movies 31%
Diagrams on blackboard 52%
Plastic figures 14%

28. Do you feel that the definite outline form of taking notes was of help?

Yes 79%; No 21%

29. Do you feel that the method of taking notes should be left up to the pupil?

Yes 59%; No 41%

30. Do you think that the supervised study period as applied to Biology should be continued next year?

Yes 17%; No 83%

31. Do you prefer seven forty-two minute periods with double lab periods, as in use the first semester, or five fifty-five minute periods with single lab periods?

Seven 82%
Five 18%

32. Which part of the lab work did you enjoy most?

Bio-chemical 30%
Food nutrients 10%
Digestion 1%
Microscope 34%
Dissection 25%

33. Under what division of work, in the lab, have you profited?

Group 54%
Individual 46%

34. List below any suggestions you have to increase interest in the Biology Club.
35. List below any criticisms of the course from students not taking Biology.
36. List below any criticisms from parents.
37. List below any criticisms from any other outside sources.
38. List your criticisms.
39. In your opinion, do you feel that a course in Biology should be required for graduation?

Yes 53%; No 47%

40. If so, enumerate the topics which you think should be included in the subject matter of such a course.
41. Select the ten topics that you are most interested in from the following list. In the spaces provided at the right of each topic place "1" after the topic of your first choice; "2" after that of your second choice, etc., until you have ten choices. If there are any other subjects you have studied that are not included in this selection, you may add them at the end of the list.

	New Rochelle Ranking	Article Ranking
a. Cells	12	21
b. Microscopic study	8	3
c. Life processes—digestion, circulation, etc.	7	14
d. Reproduction	2	9
e. Classification: plant phyla & animal phyla	....	17
f. Distribution of plants and animals	23	25
g. Growth	15	4
h. Interdependence of plants and animals	19	24
i. Adaptations	18	16
j. Behavior (nervous system)	4	6
k. Photosynthesis	22	....
l. Evolution	5	18
m. Heredity (Mendel's Laws)	3	1
n. Health principles	14	11
o. Economic importance of plants & animals	....	22
p. Fossils	17	8
q. Environment	16	7
r. Great scientists	10	19
s. Vocational biology	24	27
t. Disease & disease germs such as bacteria, etc.	6	5
u. Conservation of natural resources such as wild life, etc.	25	10
v. Eugenics	11	....
w. Euthenics	13	....
x. Leisure time biology	....	....
y. Common birds, flowers & trees	26	12
z. Sex education and social hygiene	1	10
a-1. Hobbies in biology	....	15
b-1. Working on biology projects	20	20
c-1. Reading and reporting books of biological interest	27	....
d-1. First aid	21	2
e-1. Structure of the human body	9	7
f-1. Safety education	....	13

Conclusions

1. There is no basis of comparison in interest unless we first compare the courses of study, as some topics are stressed in one section of the country which are not stressed in others.

2. Recency of study seems to influ-

ence the interest of students so that the rank of topics could be changeable.

3. The greatest interest seems to be in problems that have been more or less "taboo," such as sex, reproduction, heredity, evolution, and behavior.

4. Students are anxious to have sex instruction given in high school.

5. From the answers to questions 17, 19 and 20, and the criticisms and suggestions listed under question 36 it would seem that there is little opposition to the teaching of evolution and social hygiene in connection with this course.

6. Students prefer to formulate their final conclusions from many source materials instead of confining themselves to one textbook and the teacher's opinion.

7. Pupil interest sometimes merely reflects teacher interest.

8. The answers to question 18 would seem to indicate that this high school is not offering enough courses in biology to satisfy the needs, capacities, and interests of the students.

SPECIAL ISSUES FOR NEXT YEAR

Since the *Special Issues* of THE AMERICAN BIOLOGY TEACHER have met with general approval, plans are under way for the continuation of the series. Assembling of material for three more numbers is well along toward completion; these are *Health and Hygiene, Consumer Biology* and *Conservation.* They will probably appear in the first half of Volume 5. Plans have just been started for a special issue on *Vocational Biology,* with J. A. Trent as chairman of the committee; this will appear later next year. Certain other topics are under consideration.

Books

WARD, HENRY B., Editor. *The Foundations of Conservation Education.* The National Wildlife Federation, Washington, D. C. v + 242 pp. 1941. Paper 60¢, Buckram $1.00.

This is the third in a series of four publications by the committee on Conservation Education of the National Wildlife Federation, Henry B. Ward (Chairman), Paul B. Sears and Cyril J. Ballam.

The book is organized into six chapters, each by a specialist and leader in a particular phase of conservation. The chapter headings and authors are as follows: *Conservation, Liberty, and Economics* by Wesley C. Mitchell. *Conservation of Soil as A Natural Resource* by W. D. Lowdermilk. *The A B C of Conservation* by Paul B. Sears. *The Pitfalls of Conservation* by Arthur M. Pack. *The Role of Applied Science in Conservation and Its Relation to Wildlife* by W. W. Horner and Richard W. Horner. *Biology as the Foundation of Conservation Education* by Henry B. Ward.

The final chapter occupies approximately 40% of the book and is the part that is of greatest interest to those of us who would do an adequate job of teaching the conservation of natural resources. Dr. Ward has divided his chapter into three sections, as follows: Section One, *Life and Natural Resources.* In this section we find a discussion of soil, water, and air in relation to life with some specific teaching suggestions. Section Two, *Man's Control of Nature,* includes the public attitude, cause of the present situation, correcting past errors and protests against the destruction of resources. Section Three, *The Educational Problem,* starts with some general suggestions for correlations of the conservation education program throughout the entire school curriculum and concludes with a discussion of the evils and difficulties which beset the present status of Biology in our secondary schools and the preparation of teachers of Biology.

The book is, as its title indicates, a foundation or background, not a facts or methods presentation. It is well written and in good style. It can easily be read and understood by science teachers not particularly prepared in conservation education. There are twelve full page illustrations, no organized bibliography and no index.

The fourth publication of the committee (in press) is *Teaching Conservation Educa-*

tion in Public Schools by E. H. Reeder. It is hoped that this final number will give us specific and detailed suggestions for teaching.

P. K. HOUDEK

COLE, ELBERT C., *An Introduction to Biology.* John Wiley & Sons, New York. 518 pp. 1933. $1.75.

Mechanical Make-up: Almost eight years old, this text, as one might expect, is of the older type. The cover is an unadorned, durable, blue cloth binding with red lettering. It is $5\frac{1}{2} \times 8\frac{1}{2}$ inches with a sturdy flat dull white paper, and non-distinctive typography. The photographs and charts are small, lacking feeling, composition or balance. Little attention has been given to layout. The major emphasis for visual supplementation is on the line cut.

Literary Style: The make-up of the book is of the older type with a great deal of attention paid to scientific classification and to the types of living things belonging to each group. Plants and animals are treated separately with most attention paid to the animal kingdom. There is very little stress on similarities between plants and animals. Interrelationships between the lower animals and man receive better treatment. There is far too little space given to fundamental generalizations which should be the outcome of any general course in Biology. The reference lists are limited and difficult for the average pupil and because of the amount of scientific vocabulary used throughout, the text is suitable for the student who is college bound. There is some provision for the development of scientific thinking. The factual material is accurate but in some cases, outmoded, as in the recommended treatment for burns. One serious lack is the scant attention given so many topics which are now universally included in biology, for example: heredity, eugenics, evolution, conservation and consumer education.

The title, "Introduction to Biology," stems from the outlook of the adult rather than that of the pupil. Although the text moves along with well written and clear sentences, there is a certain aloofness in style, leaving open the gap between the teacher and pupil viewpoint. There is here somewhat of the air of the college text and manner, which the author, let it be said in fairness, would no doubt have adjusted in a later edition.

This latter comment also applies to the scientific vocabulary which recent trends in textbook writing have greatly reduced. Such terms as locule, funicle (p. 42), raphe (p. 51), palisade parenchyma (p. 108), zonation (p. 134), symbionts (p. 136), malar, frontal, temporal and coccyx (p. 181). These terms and the forms used could, with benefit to a high school biology class, be omitted or replaced with a simpler form.

Chapter headings frequently do not seem to hold out promise of interesting matter to follow. Such are "Structure, and Functions of Stems," (chapter 9), and "The Leaves of Plants," (chapter 10). Others, however, such as "How Animals Move From Place to Place," (chapter 14), "Plants That Never Blossom," (chapter 11), and "The Business of Keeping Well," (chapter 36) have more direct appeal to the pupil.

Subject Matter: To present an important point, there is a general scheme used in this text, which is challenging and commendable. Chosen at random, page 101, 110, 111, and 116 illustrate the point. First we have the effects of darkness, then a chart comparison of respiration and photosynthesis clarified by a simple diagram, showing the action taking place, and finally, as if to dare you to find out for yourself, we have some ten activities recommended. These give the student ample opportunity to make generalizations.

On page 181 we find the heading, "The Machinery of Movement," and again on page 191, "Team Work by Muscles." Both begin with practical understandable terms and lead to an interest in the human body conducive to a wish to exercise and to attain good posture.

Take Chapter 36 on "The Business of Keeping Well," as a job "*too big* and too *important* to be taken care of by individuals alone," therefore "local, state and national agencies have been formed to assist and direct in matters relating to health." Here we have an interweaving of effort and responsibility which is at once stimulating. This section of Part VI concludes with a typical summary, not a repetition but a clinching of the central ideas to be gleaned from a statement like this, "Health is ours only by constant care and watchfulness."

In general worthwhile themes are employed and the facts are brought out through practical inferences, however, much of local interest and activity must be supplemented.

Learning Exercises and Teacher Helps: There is a sufficient number of laboratory exercises, demonstrations, and experiments suggested at the close of each chapter under the heading, "Projects." However, only a brief statement of the procedure is given. More detailed directions would be welcomed by the average biology teacher.

Summaries in the form of restatments of the main theme are provided at the end of each chapter. Related reading or cross-references are also included with each chapter. The pupil and teacher reference lists could be much more complete. The list is adequate for a minimum program. But for

schools sponsoring student projects, the references are hardly adequate. A very complete index of twenty-two pages, double column is included. The text does not include a glossary, and no reference is made to a separate workbook for pupils. A manual of suggestions for teachers (14 pages) accompanies the text.

ALAN A. NATHANS (Chairman)
FRANKLIN R. MYERS, New Jersey
ANNE L. BIGLER, California
IRENE KERSTETTER, New Jersey
T. R. SEMEN, Oklahoma

ROSE, MARY S., and BOSLEY, BERTLYN. *Vegetables To Help Us Grow.* Bureau of Publications, Teachers College, Columbia University. 25 pp. 1941. Paper, 35¢.

This pamphlet explains in detail a Nutrition Unit for use in the Primary Grades, which can be presented with a minimum of equipment and expense. The "party" idea is carried out as raw vegetables are introduced, discussed, prepared for eating, and enjoyed by the group. This method should help solve food problems of some children as it teaches the value of certain foods for body growth. Some simple raw-vegetable recipes for use at home are included.

BERTHA ROBINSON,
State Teachers College,
Emporia, Kansas.

CHANDLER, ASA C. *The Eater's Digest.* Farrar & Rinehart, Inc., New York. x + 343 pp. illus. 1941. $2.75.

Not often does a book on a scientific subject achieve both technical accuracy and true popularity of style and expression. Generally one is at the expense of the other. But here is a volume that both layman and professional can read with enjoyment and profit. Wherever he can do so without misleading his readers, the author uses a common word instead of a technical term. The necessary technicalities are introduced with many illustrations and analogies, so as to make for ready understanding. Thirty-one chapters, all written entertainingly, tell about the fuel and building materials of our foods, eating and digestion, vitamins, body minerals, acidosis and alkalosis, allergies, square meals, calories, "girth control," laxation, food preservation, food-borne diseases, ptomaine poisoning, special-purpose foods and many kindred topics. This is not a "debunking" book, but it does present the essential principles of the whole subject of nutrition in such a way that the reader is able himself to separate the truth from the bunk in what he reads in the popular press and hears on the radio. There are several tabular summaries which enhance the value of the book from the reference standpoint. About forty sketches of the cartoon type add much to the enjoyment and understanding of the subjects treated. One specially useful feature, often missing from a book of this type, is the excellent index. This work should be in all libraries, especially those of high schools. Both pupils and teachers will want to refer to it over and over.

JOHN BREUKELMAN

ZIM, HERBERT S. *Mice, Men and Elephants.* Harcourt, Brace and Company. New York. 215 pp. 1942. $2.00.

This book deals with the study of mammals, their characteristics and relationships. In simple language each of the typical mammalian features is explained and illustrated. The author calls attention to the fact that sometime during their lives all mammals have hair. Their hearts are "nearly perfect pumps which help them keep up steam." They have well developed brains and are better able to use them than are the lower animals. Their methods of producing young and caring for them are unique in the animal kingdom.

Mice, Men and Elephants is written primarily for students of high school age but might prove interesting to the casual reader. Diagrams and photographs add to the simplicity and attractiveness of the book.

Of particular interest to young people is the account of the "mammals' family tree," the main groups of mammals, their interrelationships and the place of men among mammals.

The author, a science teacher himself, has had much experience with young people and has tried to make a direct appeal to them.

RUTH A. DODGE

Biological Briefs

DITMARS, RAYMOND L. *Vampires from Trinidad.* Bulletin of the New York Zoological Society 44: 171–176. November-December, 1941.

Dr. Ditmars here describes a visit to Trinidad to collect a series of vampire bats for the Zoological Society. In tropical countries this animal may present a serious problem, since its sharp, gashing bite leaves a wound which may bleed several hours and which may transmit such diseases as trypanosomiasis and paralytic rabies. The species has been greatly reduced in its Trinidad distribution by intensive hunting under government auspices, but 19 specimens were secured in hollow trees and caves. In captivity,

they may be maintained by daily feedings of defibrinated ox blood. They seem rather intelligent and quickly adapt themselves to the routine of their new environment.

BRAHDY, LEOPOLD. *Immunity and Positive Tuberculin Reaction.* American Journal of Public Health 31: 1040–1043. October, 1941.

It has been known for some years that the majority of the population acquire a primary tuberculous infection at an early age, but never show any outward signs of serious illness. These cases all exhibit a positive reaction to the tuberculin skin test. Until the beginning of this century, almost all people were thus infected; now approximately half the population reach the age of 18 without infection. In a study made on 1320 nurses in training, all exposed in the course of their work to the bacillus, it has been shown that such primary infections create a resistance to subsequent severe attacks of the disease. Specifically, demonstrable tuberculous lesions occurred 8 times as frequently among the originally non-reactors as among the positive reactors.

HAMILTON, WILLIAM J. *Winter Sleep.* The New England Naturalist 2: 25–27. January, 1942.

There are differences in the degree of hibernation exhibited by the mammals of the New England area. The black bear does not become completely torpid, maintaining the high temperature necessary for the survival of cubs born long before spring thaws. Chipmunks exhibit a deeper sleep, but they often emerge to feed upon their stores in January and February. The racoon is also brought out of a few weeks' hibernation by two or three nights of thawing weather. Among skunks, the females and young of the previous spring sleep longer than the males. True hibernation is exhibited by the woodchuck, which may double its weight by heavy feeding from June until late September and then during a five-month period exhibits a greatly lowered metabolic rate as judged by lowered body temperature and sharply reduced respiration. Unlike the active deer mice, the jumping mouse enjoys a complete hibernation until April, losing nearly 40% of its autumn weight. Bats hang head downward in great masses in the comparative warmth and constant temperature of caves throughout the winter months.

NAYLOR, E. E. *On Your Knees! (But It Does Not Pay if You Are after Dandelions.)* Journal of the New York Botanical Garden 42: 245–247. October, 1941.

Recent studies on the regeneration of dandelions from root cuttings show that if a portion of the fleshy tap-root remains exposed to the air or is partially covered with humus, rapid growth of a new crown, often with several stems and auxiliary roots, takes place. Persistent digging of roots each time such growth takes place will eventually kill the plant, but a more effective method is the application of salt to the root after removing the crown, or the careful use of chemical sprays.

GLESINGER, EGON. *Forest Futures as Seen against a Background of World War.* American Forests 48: 7–9; 36; 43. January, 1942.

There are indications that the present conflict may bring about as profound changes in world forests and timber trade as World War I did for agriculture. Prior to this war, the European nations which had forest surpluses supplied wood for those which did not; the western hemisphere shipped very little. Since Germany has taken them over, the wood surpluses of Central Europe are largely depleted and may perhaps be insufficient for reconstruction needs at home. Wood has greatly increased its uses in Europe, not only as fuel but also as raw material for livestock feed, artificial fibers, alcohol, sugar, resins, turpentine, and even lubricating oils. At the close of war, it seems likely that either wood consumption must be sharply reduced, or that the production of the western hemisphere must be greatly increased to meet a new development in world trade.

PIRONE, P. P. *Tree Injections.* American Forests 48: 32–33; 43. January, 1942.

During the past year wide publicity has been given to tree injections as a treatment for a great variety of ills. There is a limited basis of fact for this; while at present there is no known chemical specific enough to arrest the growth of a parasitic fungus or to destroy it without injury to the tree, some progress has recently been made in finding substances which act as antidotes to the toxins of some fungi. Where known nutritional deficiencies exist, the needed materials may be sealed in a half-inch hole drilled into the sapwood. Some success has been attained in England by injecting fertilizers into the trunks of apple trees. Until experimentation has progressed further, however, it would be wise to check all cure-all claims for tree injections with the United States Department of Agriculture or with state agricultural colleges.

BOGERT, M. R., and BOGERT, C. M. *Don't Skin Your Skunk.* Natural History 49: 26–31. January, 1942.

The distribution of the spotted skunk, while not so wide as that of his striped relative, still extends over half the area of the United States. The authors describe the antics and development of a female spotted skunk and her male offspring born and maintained on the campus of the University of California at Los Angeles. While in the wild the diet of these animals consists largely of lizards, insects, snails, and small rodents, supplemented by berries and herbs, in captivity they ate voraciously of canned dog food and subsisted for a month without any apparent ill effects on fresh figs and avocados. Hairy caterpillars and desert tarantulas were rolled on the ground to remove the hairs before being devoured, and when a strong onion refused to divest itself of its scent under similar handling, it was rejected. The animals are fully grown before three months and can probably use their scent-glands from the age of six weeks.

RETTEW, C. RAYMOND. *The Cultivation of Mushrooms.* Journal of the New York Botanical Garden 43: 8–14. January, 1942.

The extensive cultivation of mushrooms has been undertaken in the United States only since 1918, mainly under conditions carefully set up to meet their special needs. The species used commercially is one of the common field-mushrooms, *Agaricus campestris.* The spores are taken from the mushroom under sterile conditions and grown on a carefully balanced medium to develop into the mass of root-like mycelium, or spawn; this is inoculated into culture jars filled with sterile medium (usually made of tobacco stems combined with humus and suitable chemicals) and placed in large constant-temperature rooms until it is well developed. The spawn can then be planted in composted, cured, and steam-pasteurized horse manure or can be slowly dried and kept for several years in a dormant state. Although artificial culture media have been tried, they are not yet commercially profitable as a substitute for manure. The growing is done indoors under conditions of constant, fairly cool temperature, low humidity, and good ventilation.

RUTH SHERMAN STEIN.

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